



9-5-2013

# Public Health Services & Systems Research: Concepts, Methods, and Emerging Findings

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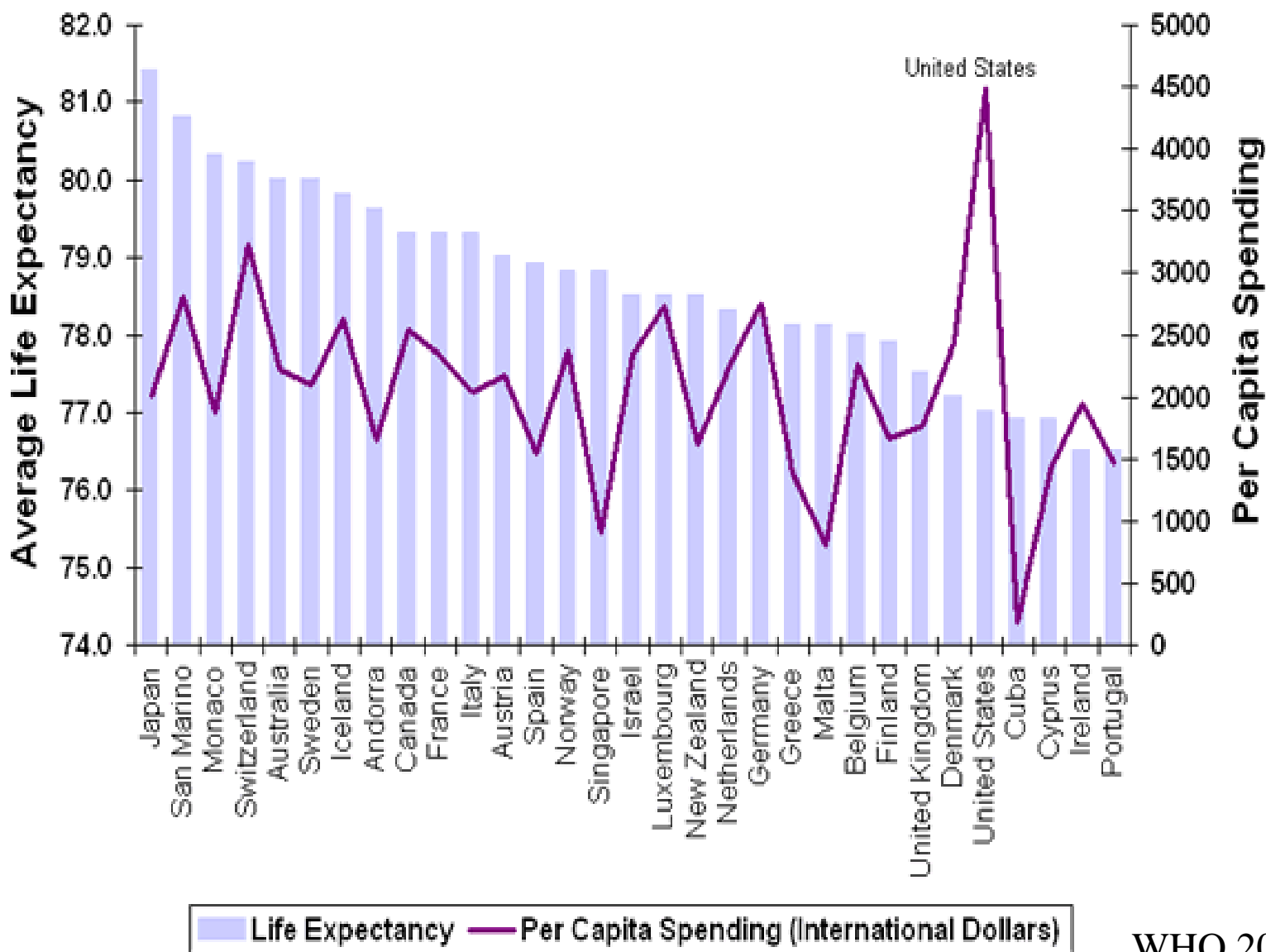
# Public Health Services & Systems Research: Concepts, Methods, and Emerging Findings

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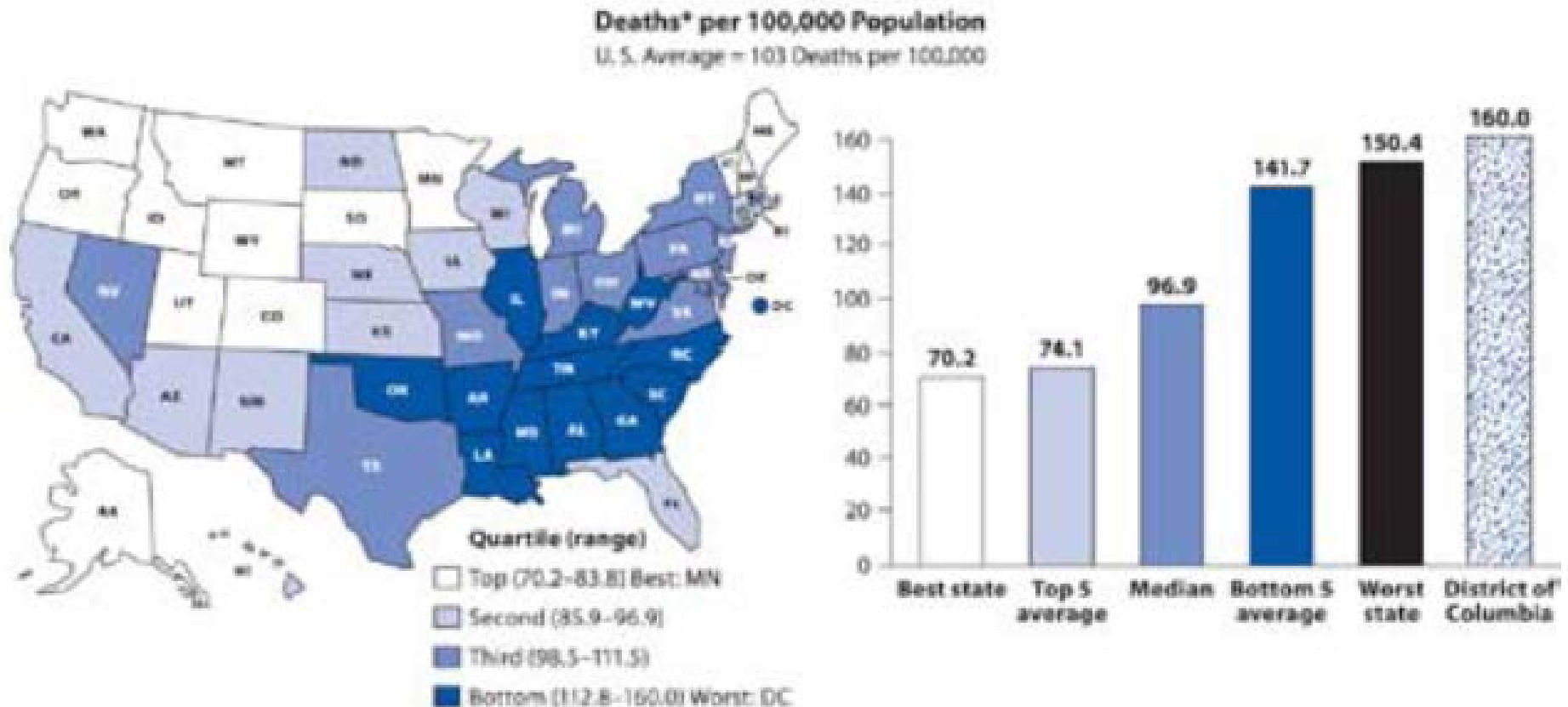
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# Fundamental health system performance



# Geographic variation in population health



# Preventable disease burden and national health spending

**>75%** of national health spending is attributable to conditions that are largely preventable

- Cardiovascular disease
- Diabetes
- Lung diseases
- Cancer
- Injuries
- Vaccine-preventable diseases and sexually transmitted infections

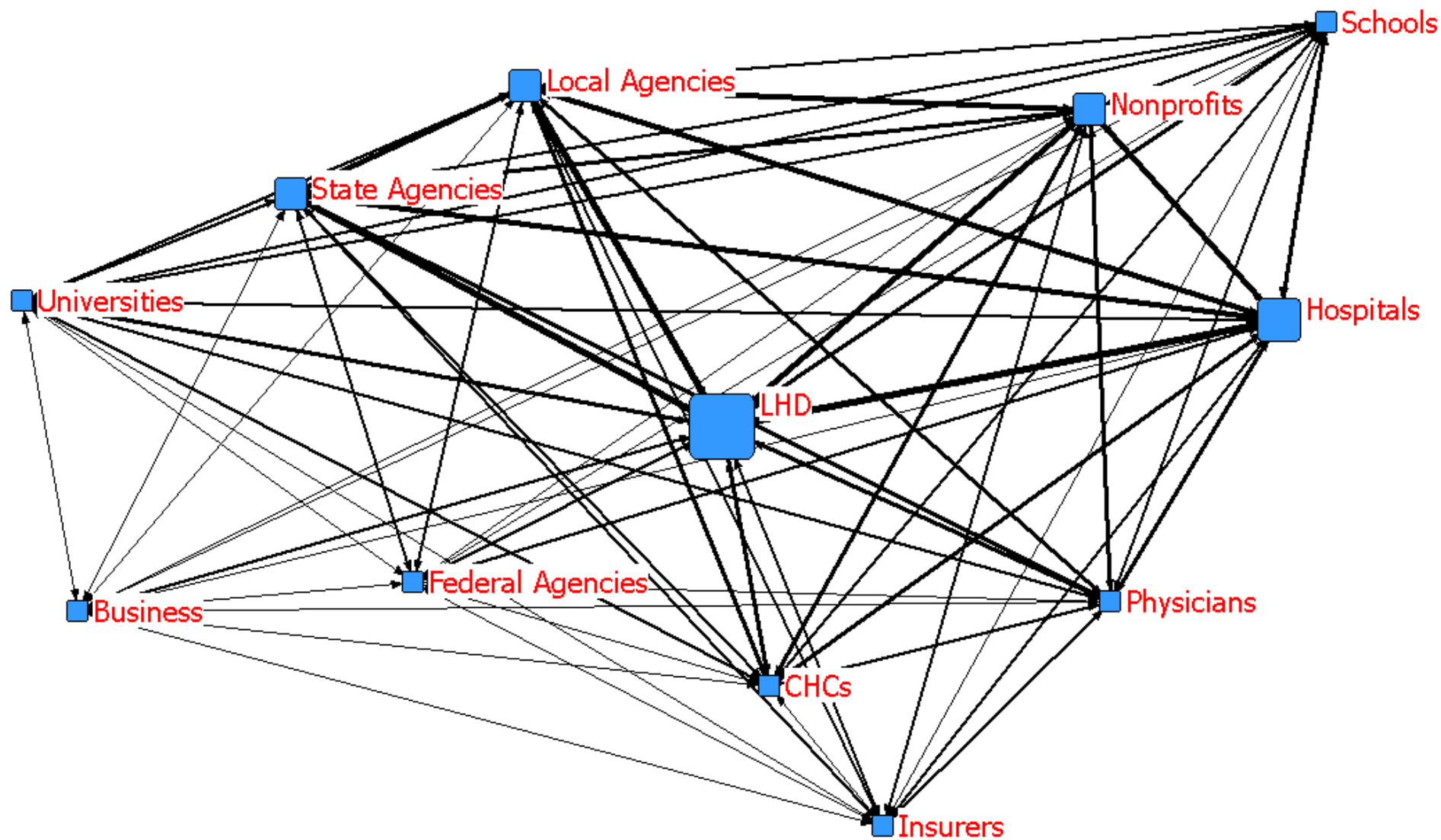
**<5%** of national health spending is allocated to public health and prevention

# Public health activities

Organized programs, policies, and laws to prevent disease and injury and promote health on a population-wide basis

- Epidemiologic surveillance & investigation
- Community health assessment & planning
- Communicable disease control
- Chronic disease and injury prevention
- Health education and communication
- Environmental health monitoring and assessment
- Enforcement of health laws and regulations
- Inspection and licensing
- Inform, advise, and assist school-based, worksite-based, and community-based health programming
- ...and roles in assuring access to medical care

# Public health delivery systems



National Longitudinal Survey of Public Health Systems, 2012

# Public health services & systems research

A field of inquiry examining the ***organization***, ***financing***, and ***delivery*** of public health services at local, state and national levels, and the ***impact*** of these activities on population health



# Why study public health delivery?

“The Committee had hoped to provide specific guidance elaborating on the types and levels of workforce, infrastructure, related resources, and financial investments necessary to ensure the availability of essential public health services to all of the nation’s communities. However, such evidence is limited, and there is no agenda or support for this type of research, despite the critical need for such data to promote and protect the nation’s health.”

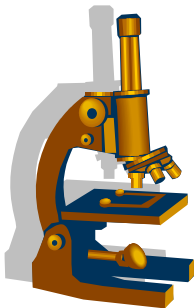
—Institute of Medicine, 2003



# PHSSR's place in the continuum

## Intervention Research

- What works – proof of efficacy
- Controlled trials
- *Guide to Community Preventive Services*



## Services/Systems Research

- How to organize, implement and sustain in the real-world
  - Reach
  - Enforcement/Compliance
  - Quality/Effectiveness
  - Cost/Efficiency
  - Equity/Disparities
- Impact on population health
- Comparative effectiveness & efficiency

# **PHSSR and policy relevance**

## **Subtitle D—Support for Prevention and Public Health Innovation**

### **Patient Protection and Affordable Care Act of 2010**

#### **SEC. 4301. RESEARCH ON OPTIMIZING THE DELIVERY OF PUBLIC HEALTH SERVICES.**

(a) **IN GENERAL.**—The Secretary of Health and Human Services (referred to in this section as the “Secretary”), acting through the Director of the Centers for Disease Control and Prevention, shall provide funding for research in the area of public health services and systems.

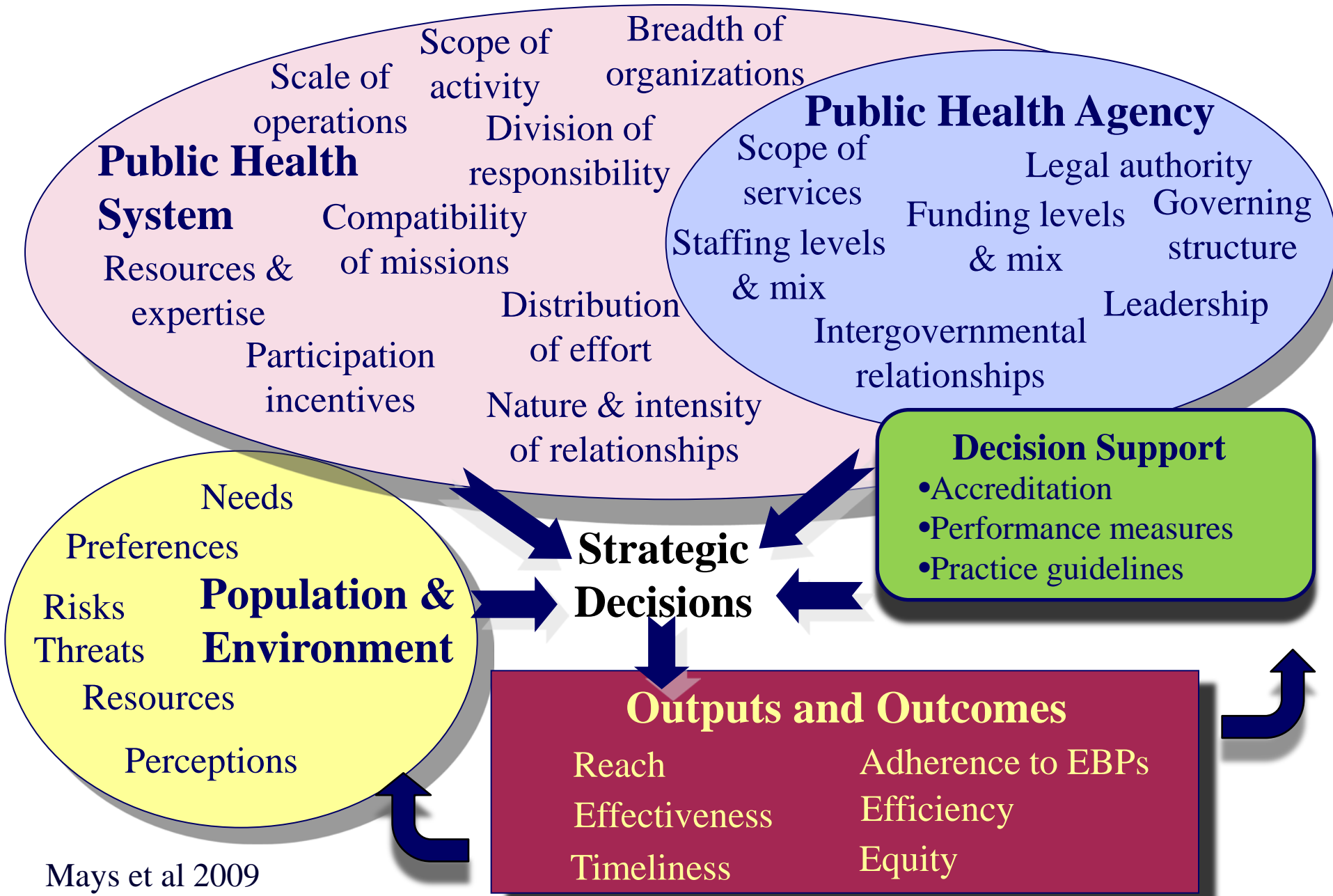
(b) **REQUIREMENTS OF RESEARCH.**—Research supported under this section shall include—

(1) examining evidence-based practices relating to prevention, with a particular focus on high priority areas as identified by the Secretary in the National Prevention Strategy or Healthy People 2020, and including comparing community-based public health interventions in terms of effectiveness and cost;

(2) analyzing the translation of interventions from academic settings to real world settings; and

(3) identifying effective strategies for organizing, financing, or delivering public health services in real world community settings, including comparing State and local health department structures and systems in terms of effectiveness and cost.

# Complexity in public health delivery



# **Emerging evidence: organization and structure**

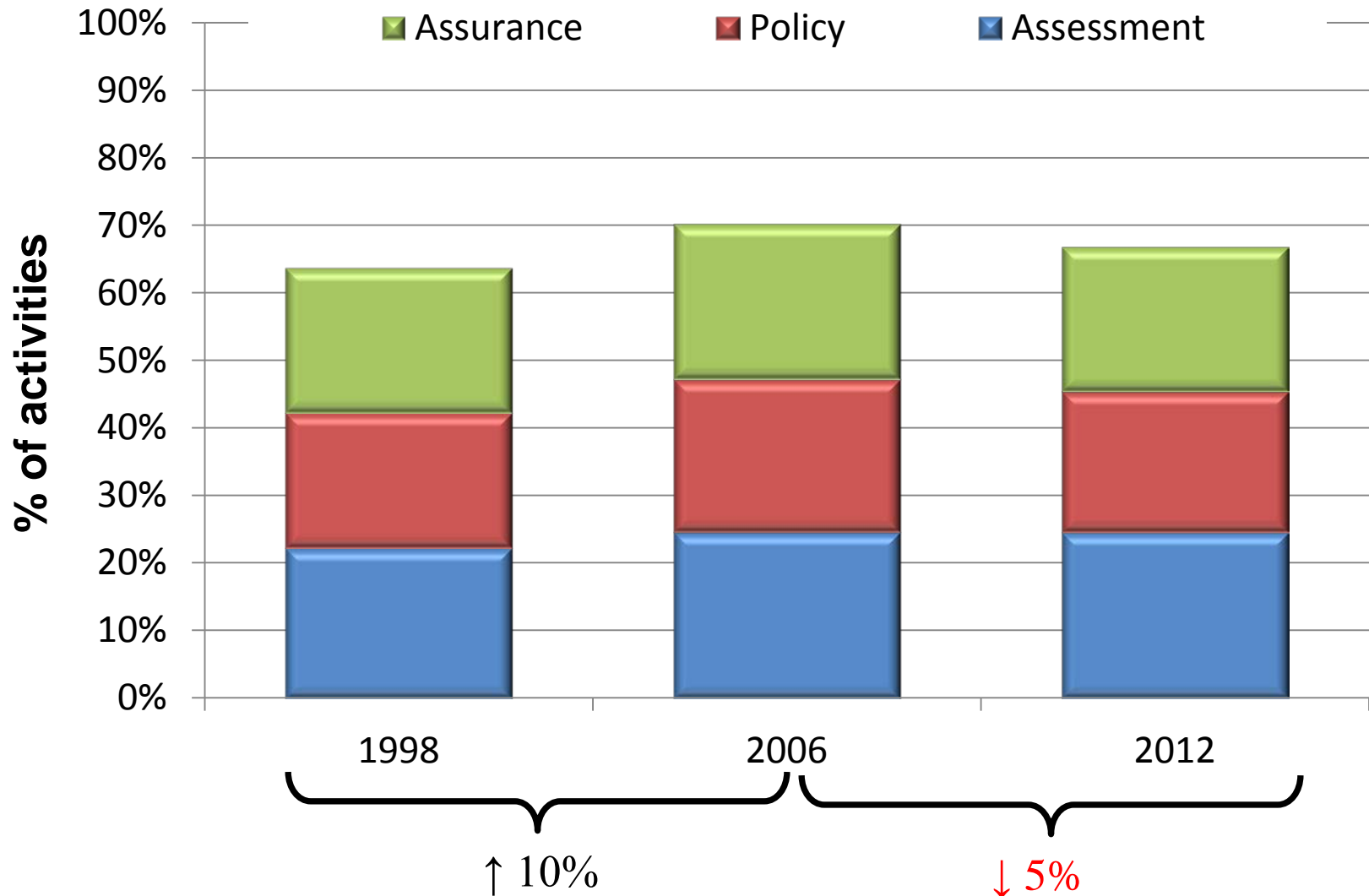
- Who contributes to public health delivery?
- How are roles and responsibilities divided?
- How and why do delivery systems vary and change over time?
- How do system structures affect public health delivery and outcomes?

# Data: public health production

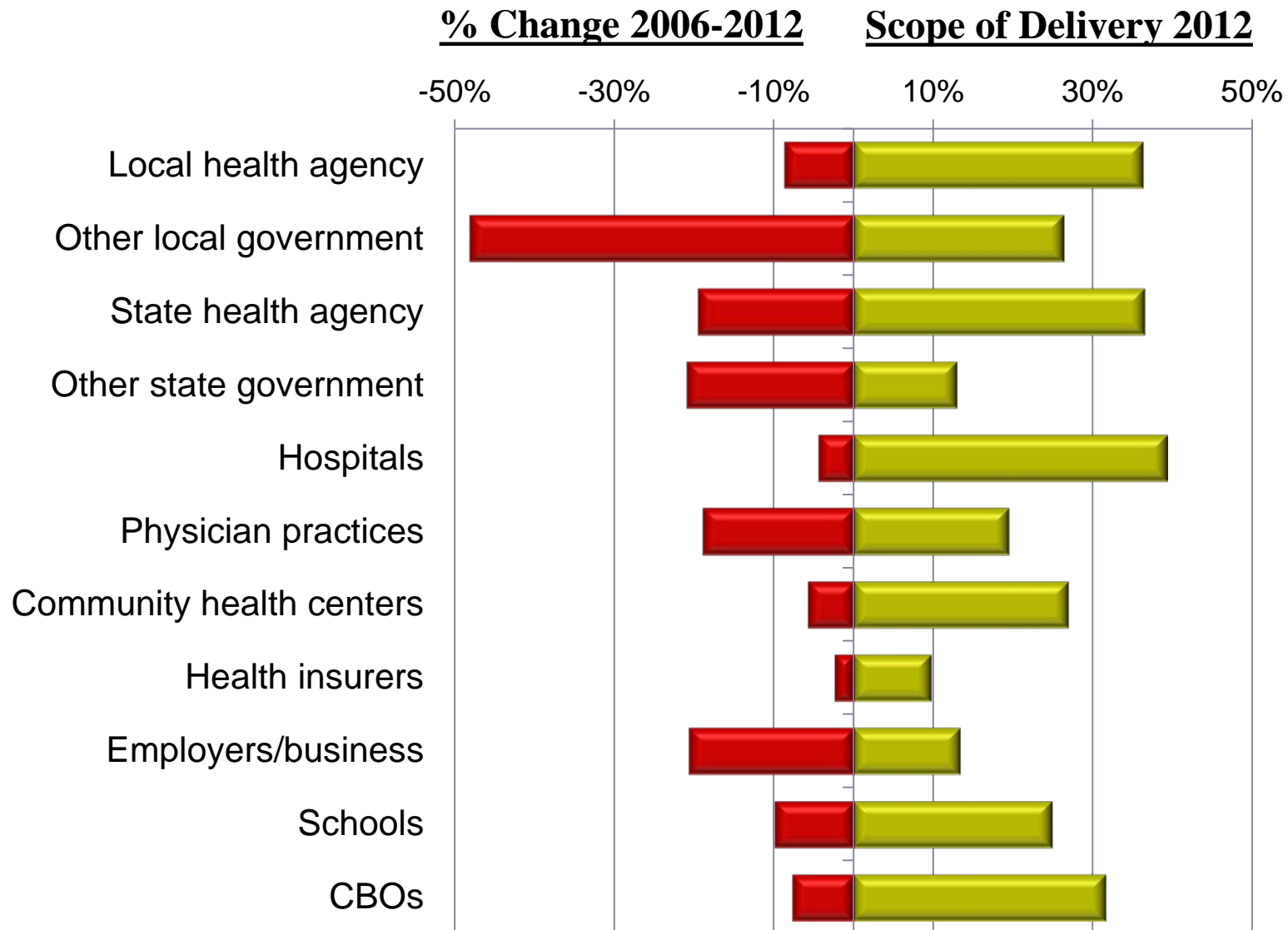
- National Longitudinal Survey of Public Health Systems
- Cohort of 360 communities with at least 100,000 residents
- Followed over time: 1998, 2006, 2012
- Measured from local public health official's perspective:
  - **Scope**: availability of 20 recommended public health activities
  - **Network**: types of organizations contributing to each activity
  - **Effort**: contributed by designated local public health agency
  - **Quality**: perceived effectiveness of each activity

# National Longitudinal Survey of Public Health Systems

## Delivery of recommended public health activities



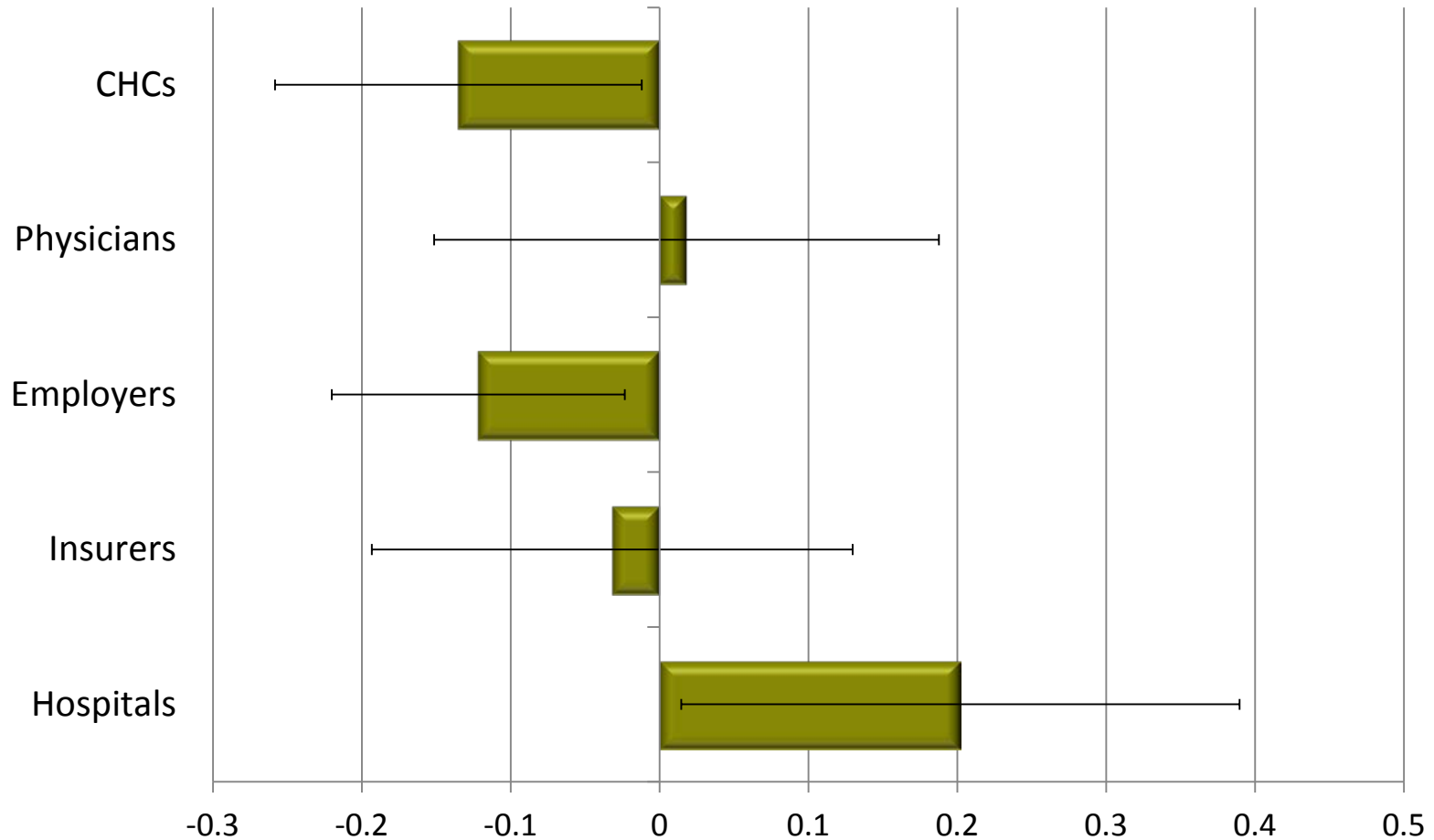
# Organizations engaged in local public health delivery





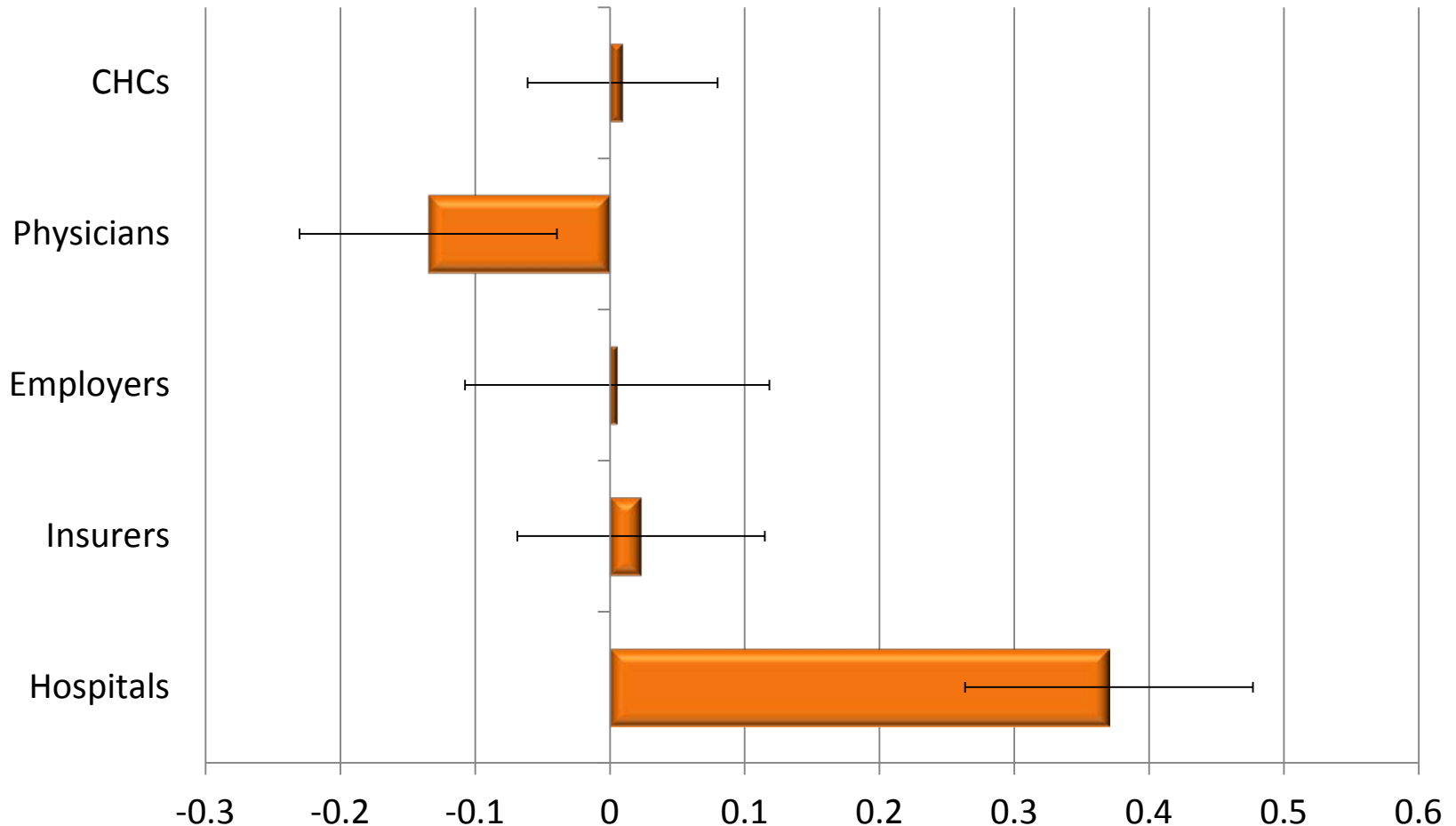
# Estimated Complementarity and Substitution Effects on Local Health Department Contributions

Results from Multivariate GLLAMM Models



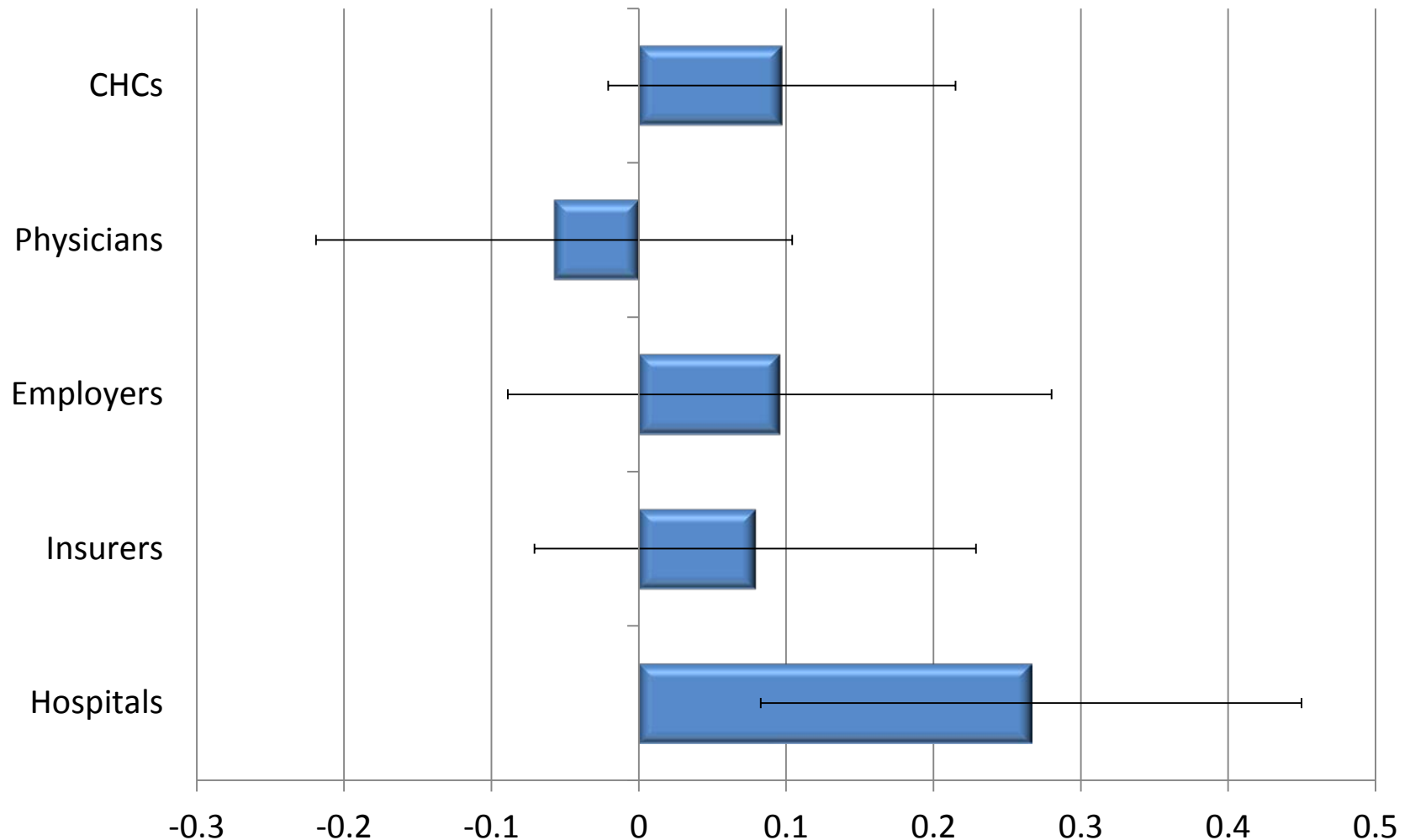
# Estimated Contribution Effects on Quantity of Public Health Services

Results from Multivariate GLLAMM Models



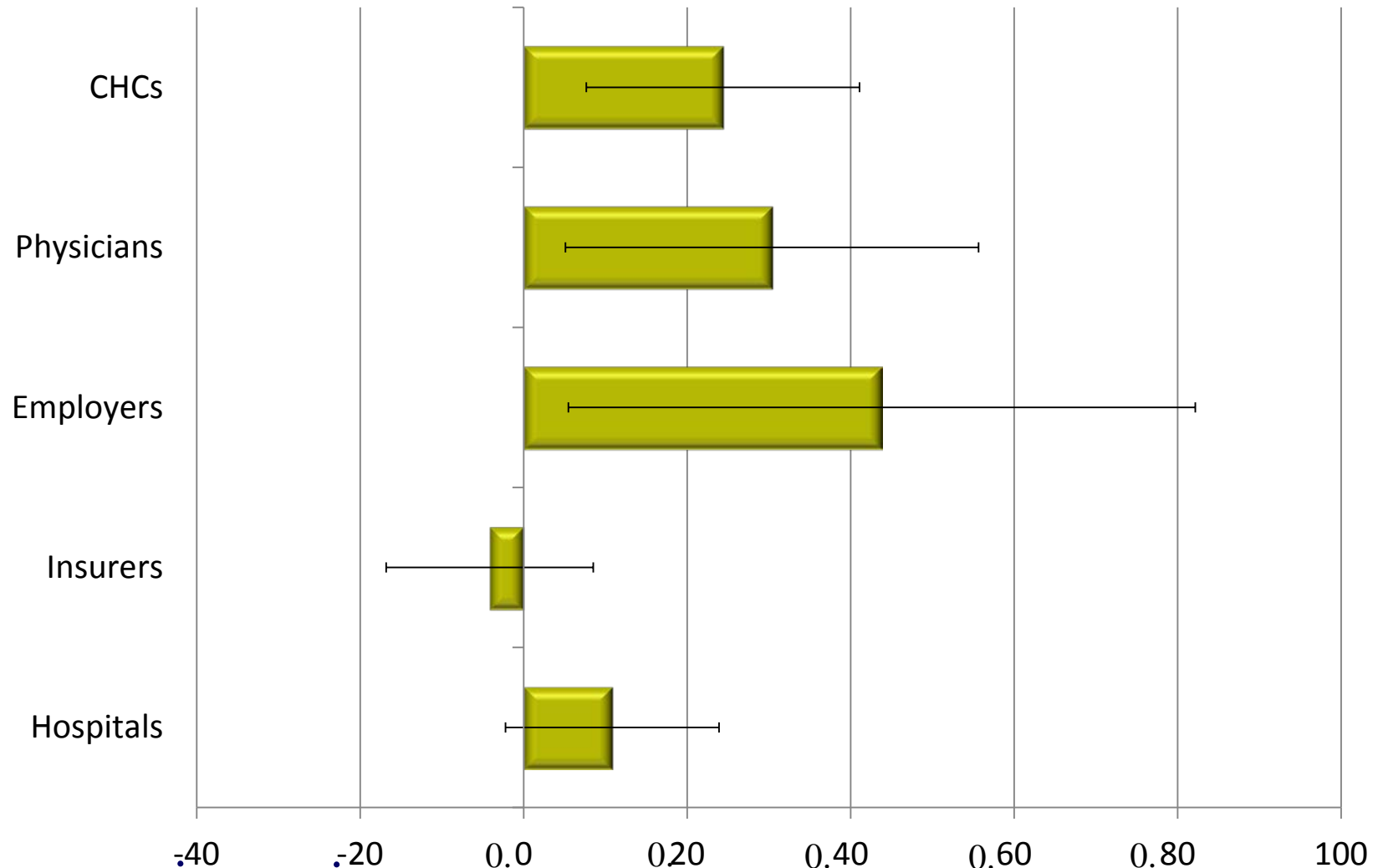
# Estimated Contribution Effects on Quality of Public Health Services

Results from Multivariate GLLAMM Models



# Estimated Contribution Effects on Local Public Health Expenditures

Results from Multivariate GLLAMM Models



# Estimated Effects of Institutional and Market Incentives on Hospital Contributions

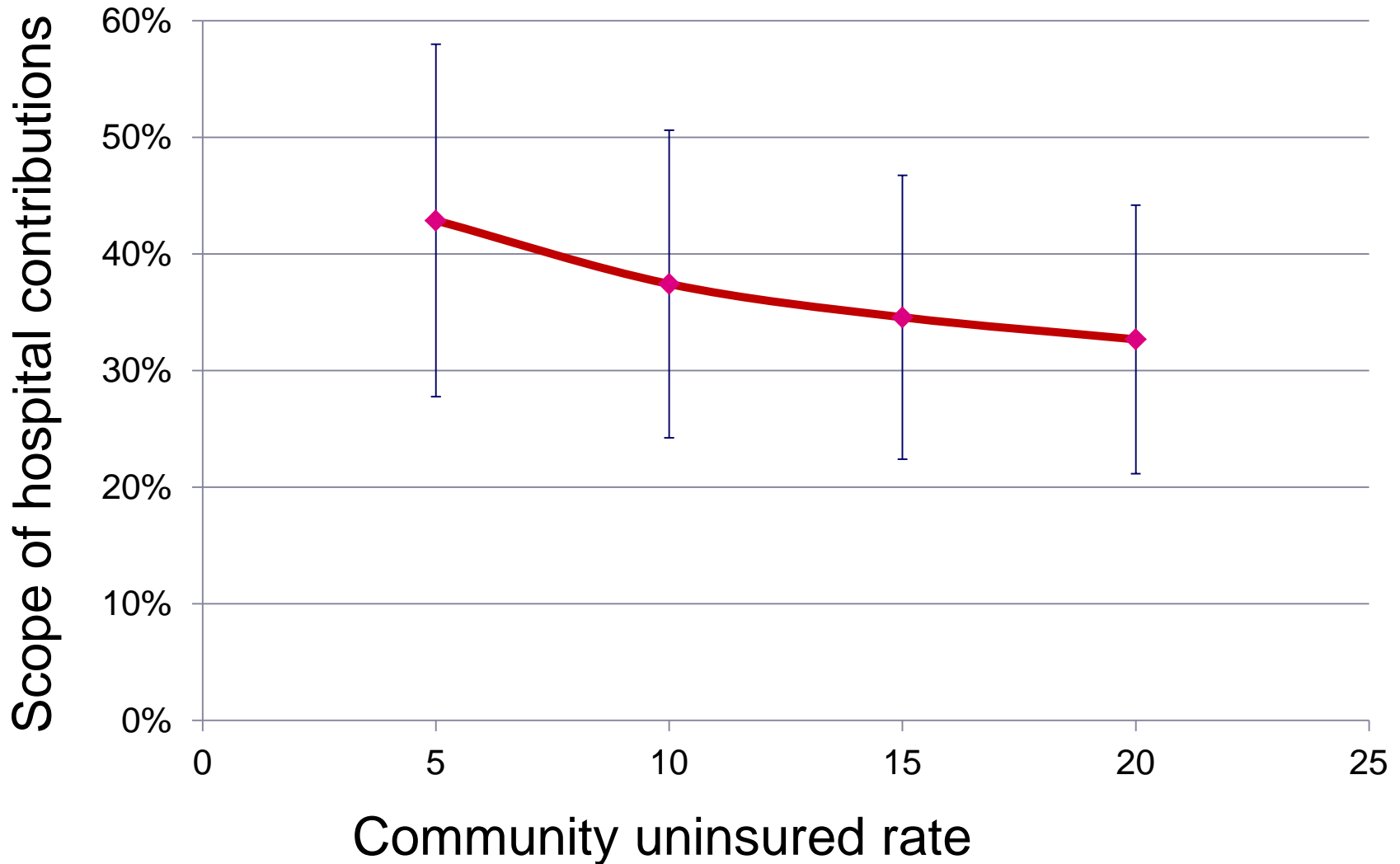
## Results from Multivariate GLLAMM Models

	Elasticity Estimates			
Variable	<u>Overall</u>	<u>Assessment</u>	<u>Policy</u>	<u>Assurance</u>
Percent residents uninsured	-0.190**	-0.309**	-0.215**	-0.010
Charity care costs/capita (1000s)	-0.265	0.073	-0.533	-0.441
Any hospitals located in the area	0.769**	0.736*	0.662*	1.113*
Number of hospitals   Any	-0.056**	-0.036	-0.070*	-0.065
Market concentration (HHI index)	-0.050	0.026	-0.004	-0.232**
Market share of nonprofit hospitals	0.001	-0.060	-0.036	0.154*

\*\*p<0.05

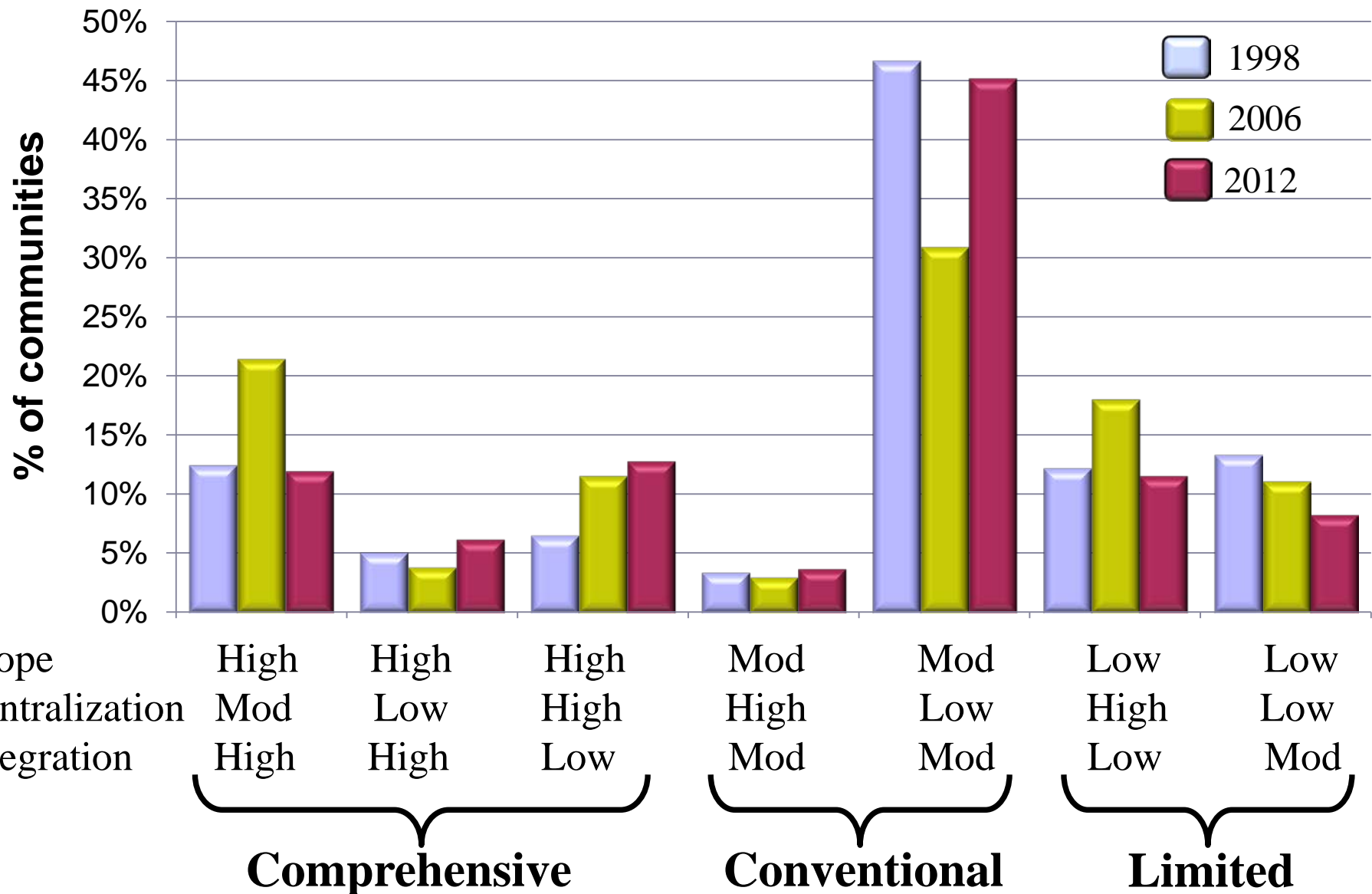
\*p<0.10

# Estimated Crowd-out Effect



Holding all other variables constant in the model

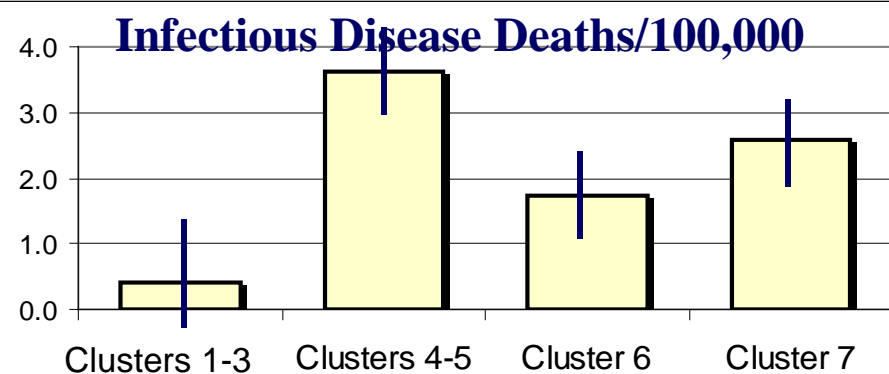
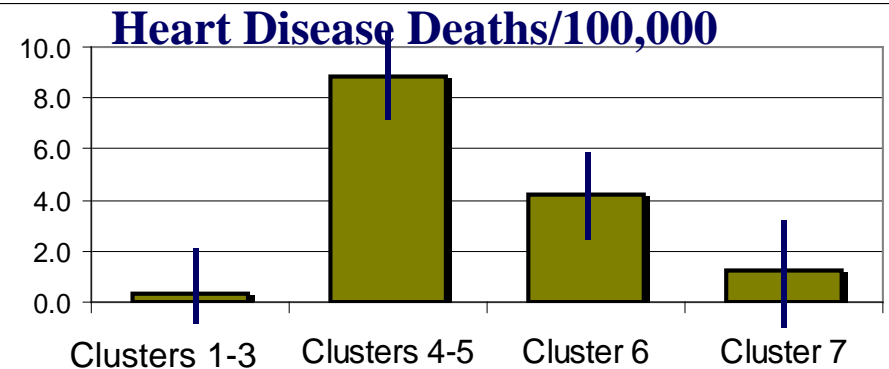
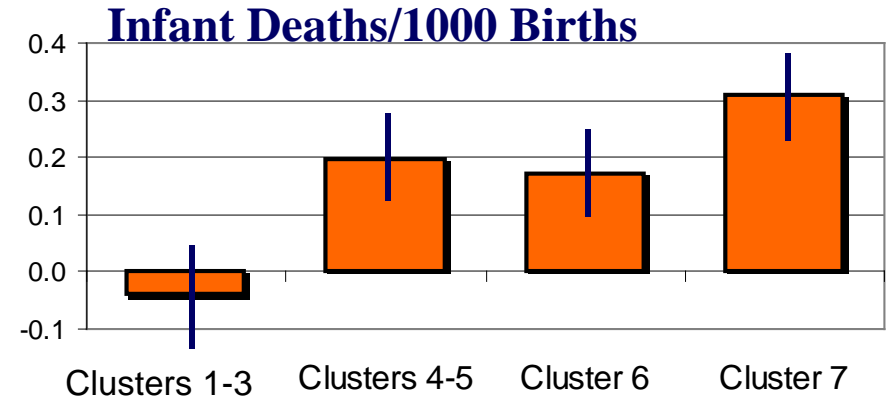
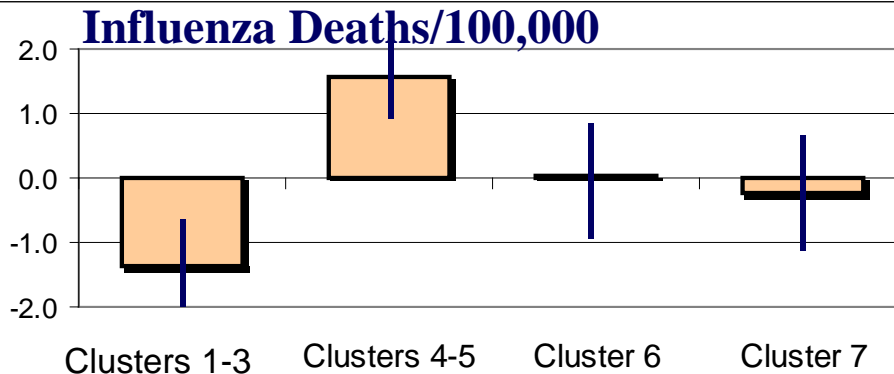
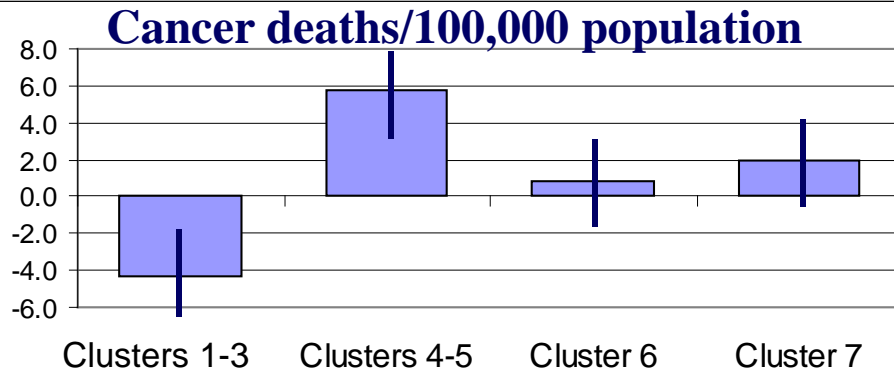
# A typology of public health delivery systems



Source: Mays et al. 2010; 2012

# Changes in health associated with delivery system

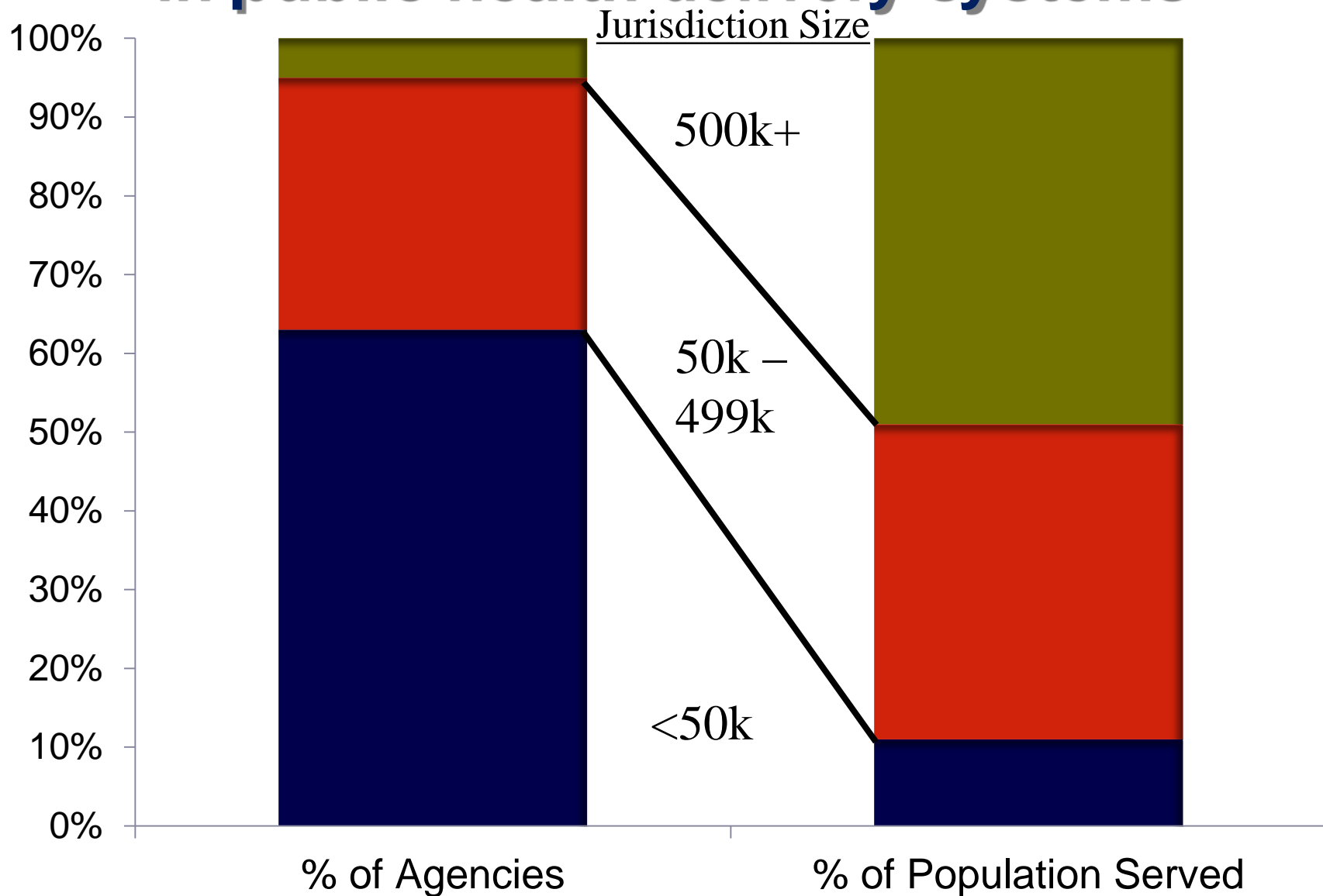
## Percent Changes in Preventable Mortality Rates by System Typology (cluster)



Fixed-effects models control for population size, density, age composition, poverty status, racial composition, and physician supply



# Economies of scale and scope in public health delivery systems

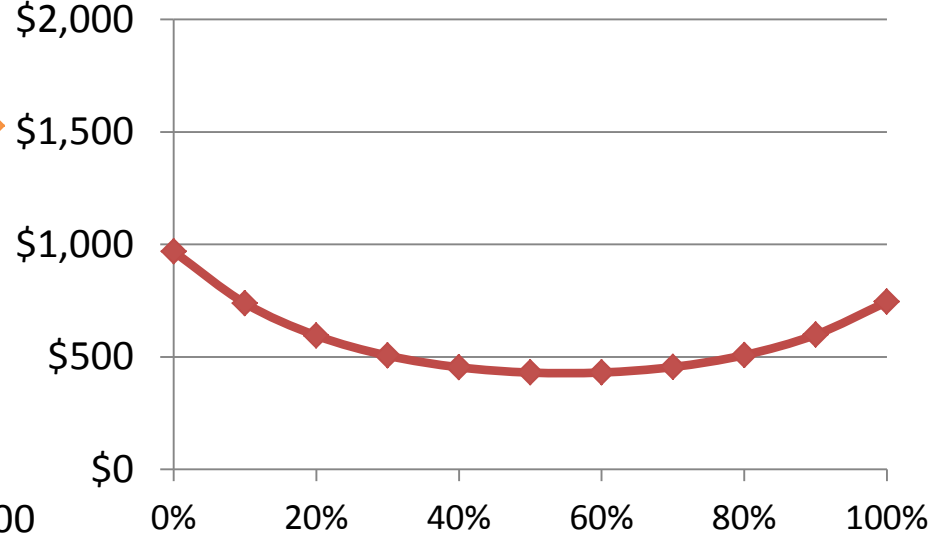
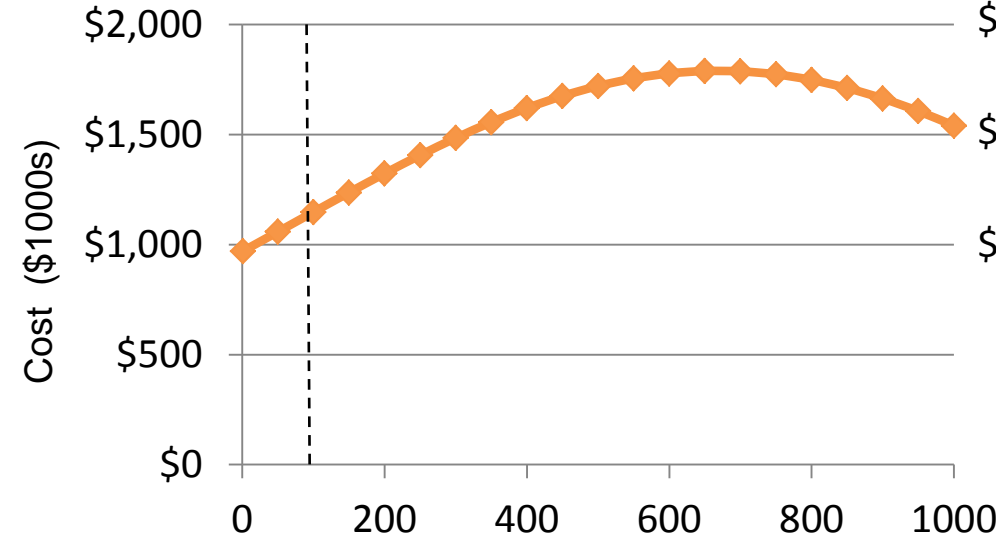


Source: 2010 NACCHO National Profile of Local Health Departments Survey

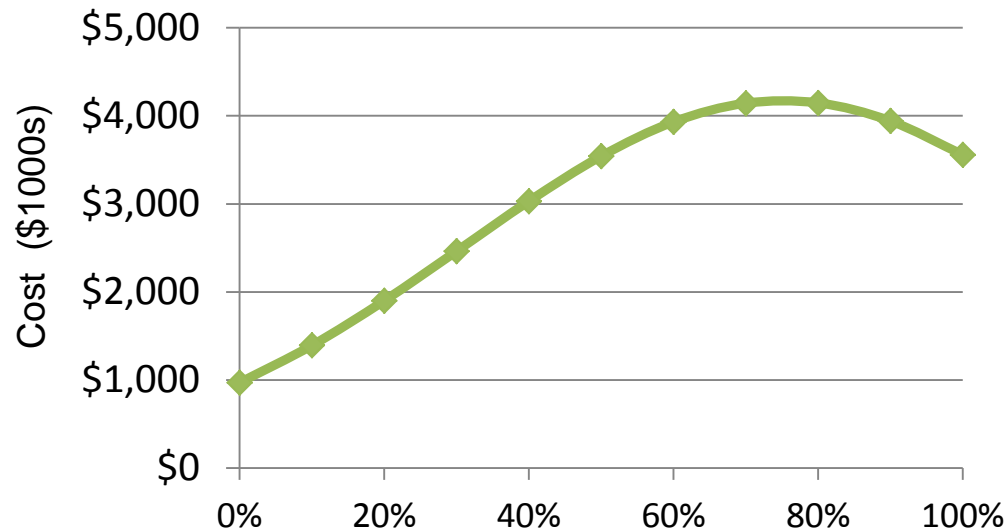
# Empirical estimates of scale and scope economies

**Scale (Population in 1000s)**

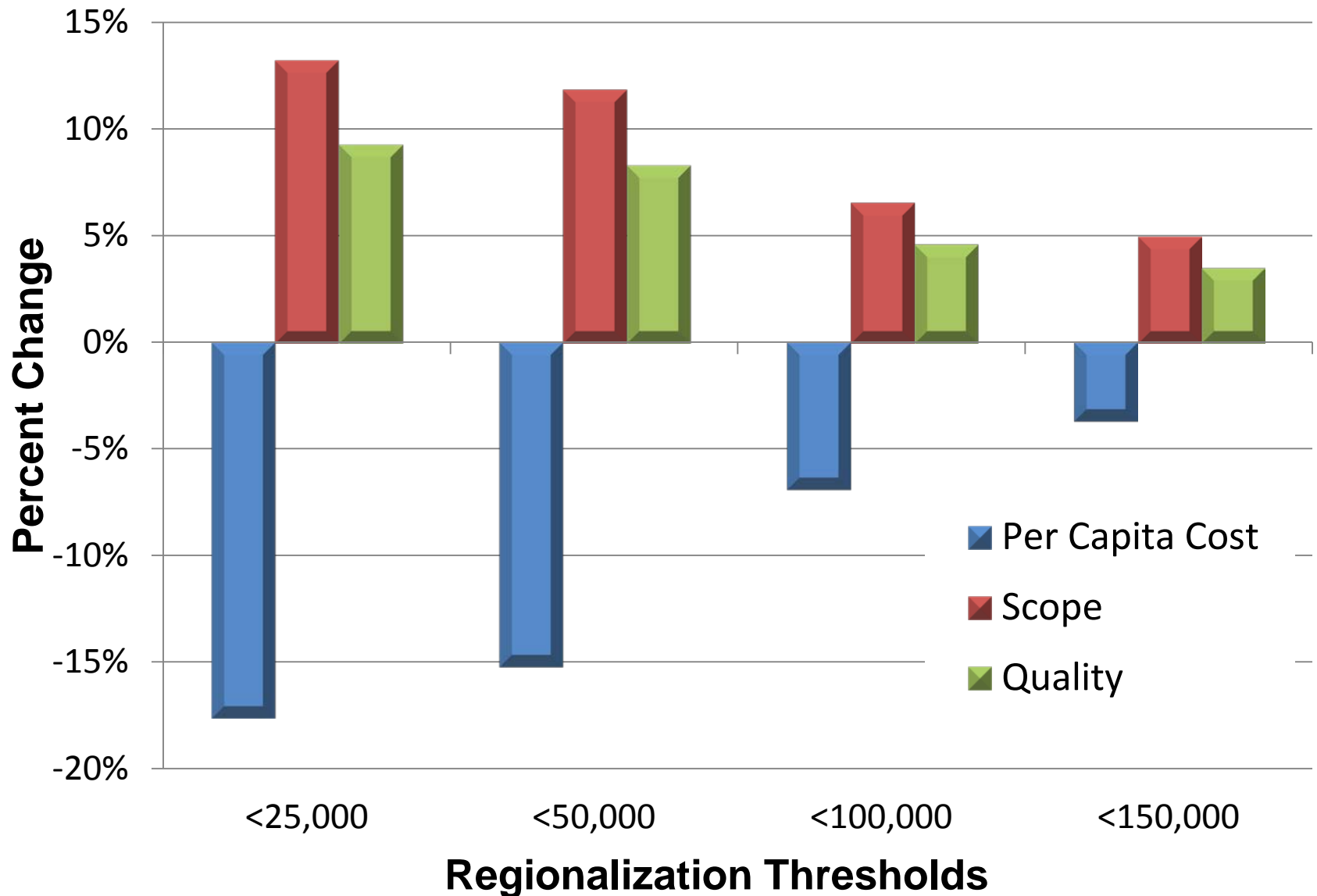
**Quality (Perceived Effectiveness)**



**Scope (% of Activities)**



# Simulated Effects of Regionalization



# Emerging evidence: finance and economics

- How does *public health* spending vary across communities and change over time?
- What are the health effects attributable to changes in public health spending?
- What are the medical cost effects attributable to changes in public health spending?
- What are the opportunities for improving efficiency in public health delivery?

# Public health's share of national health spending

USDHHS National Health Expenditure Accounts

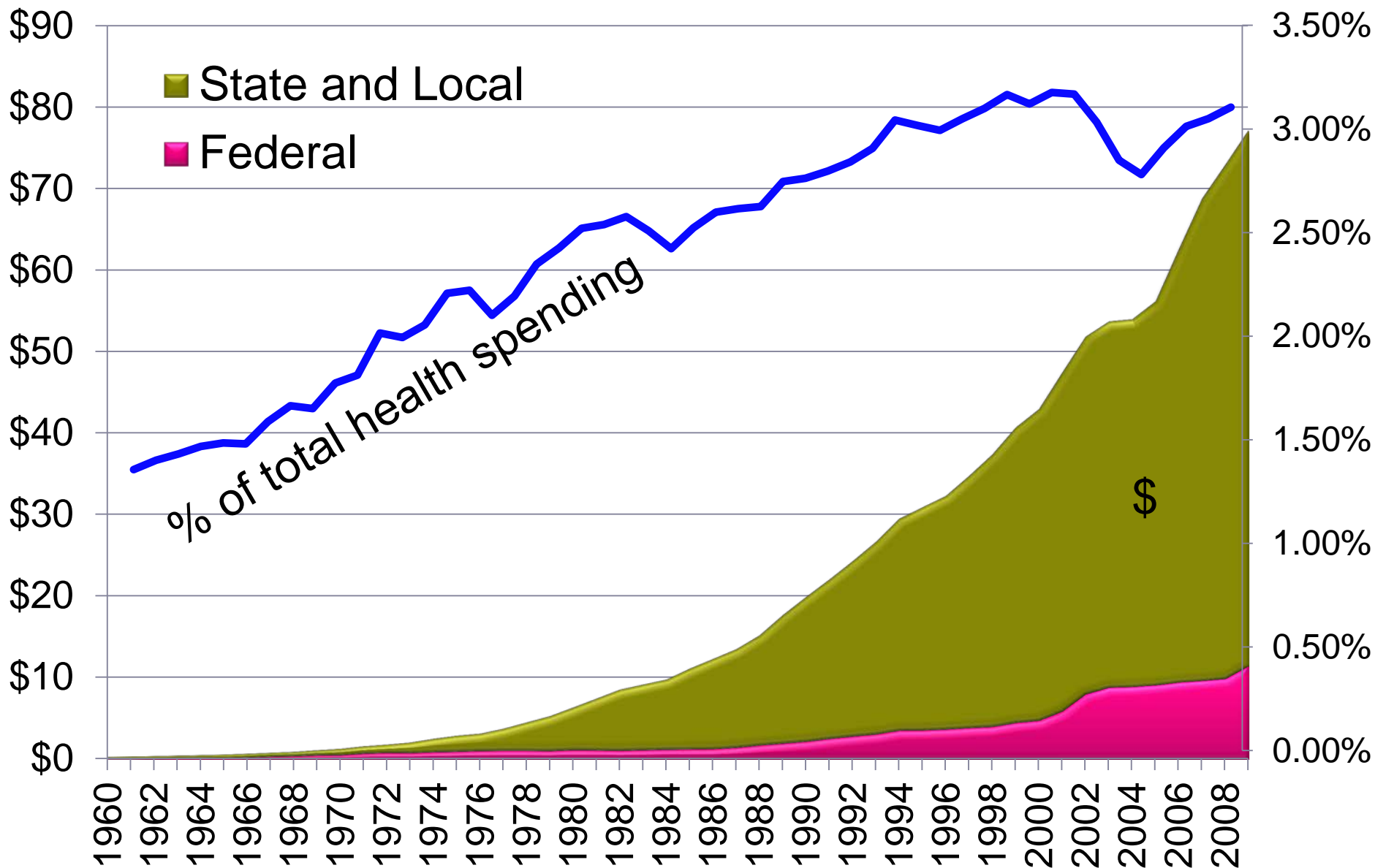
\$Billions

%NHE

■ State and Local  
■ Federal

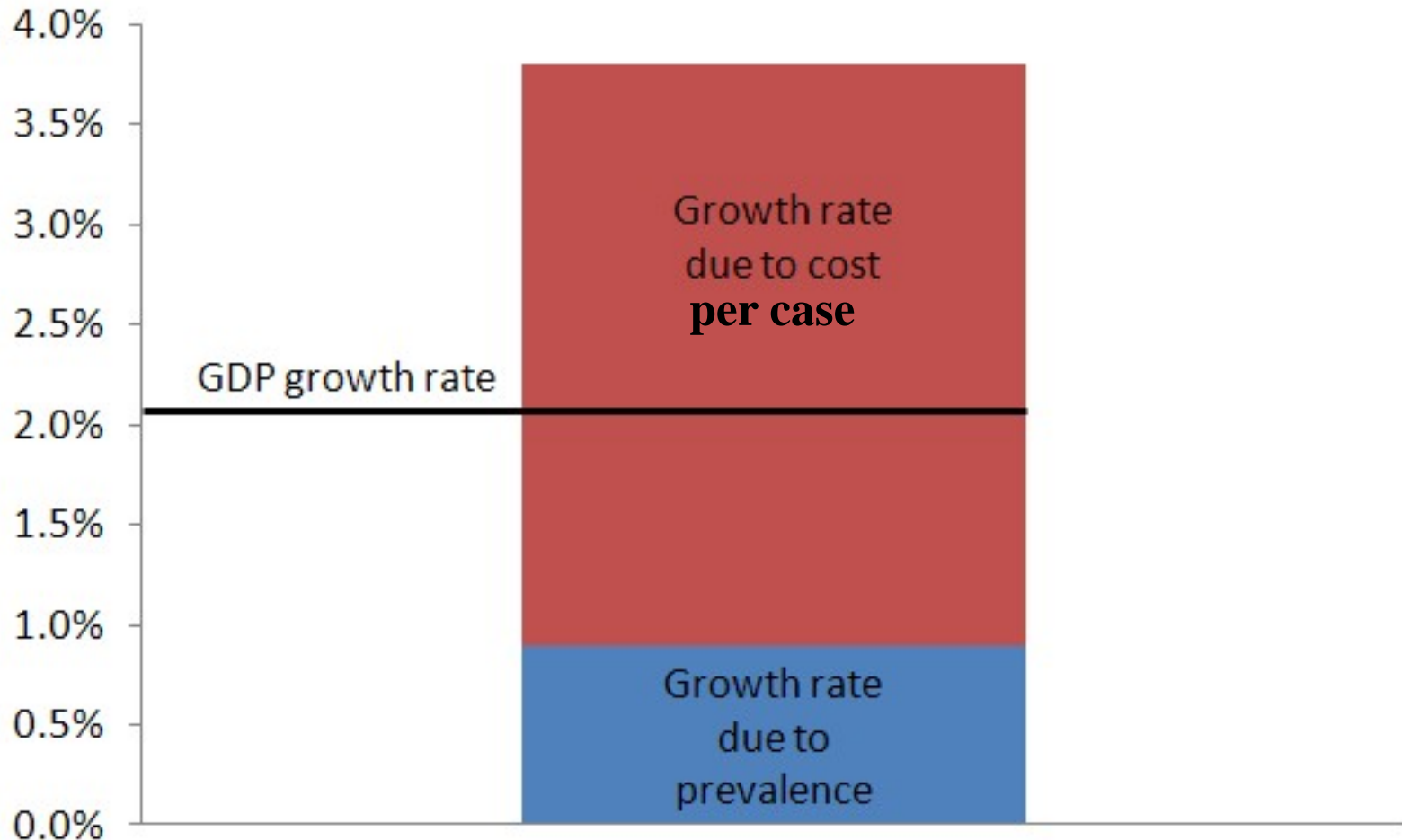
% of total health spending

\$

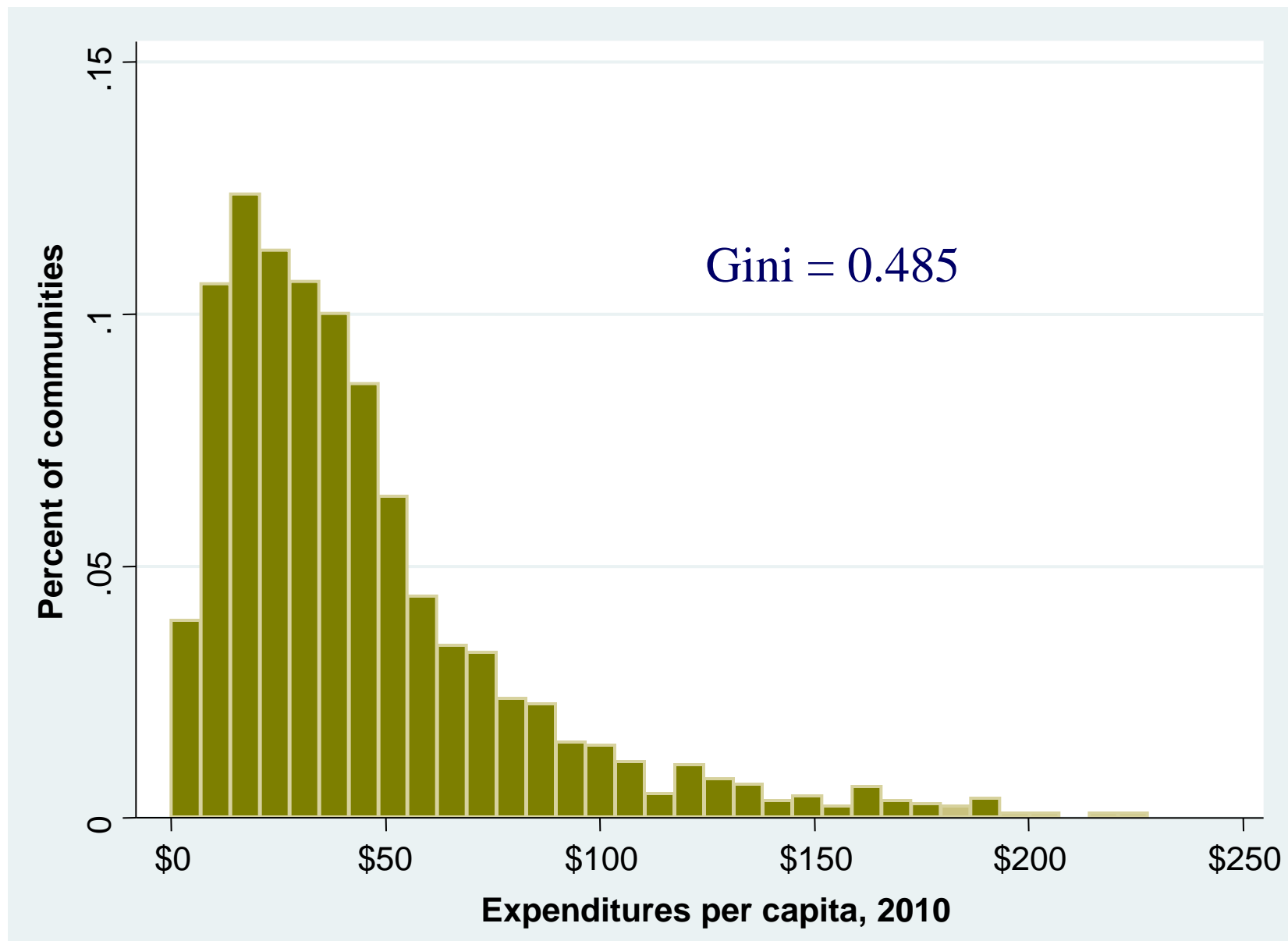


# Factors driving growth in medical spending

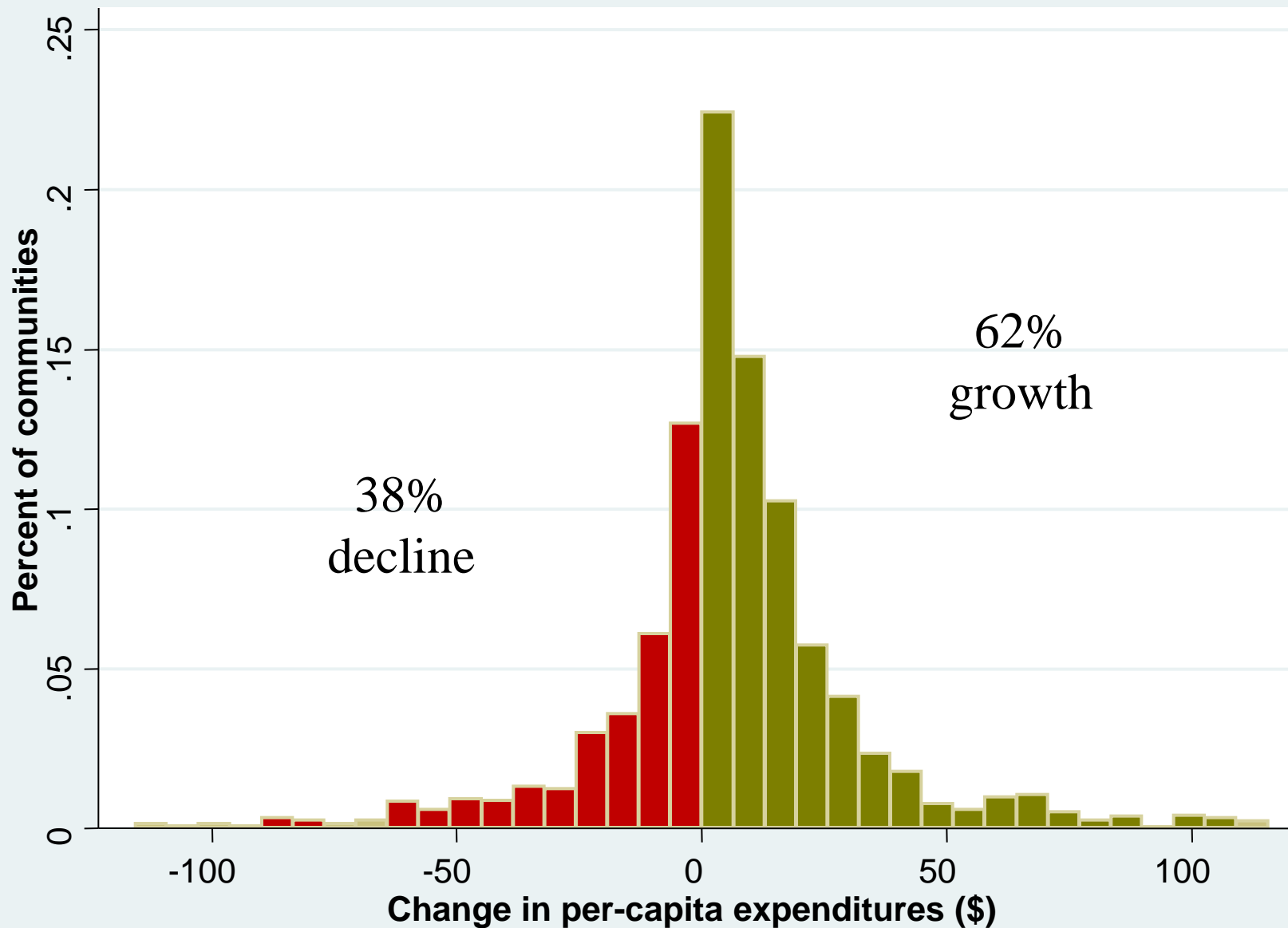
Health spending growth rate 1996-2006



# Variation in Local Public Health Spending

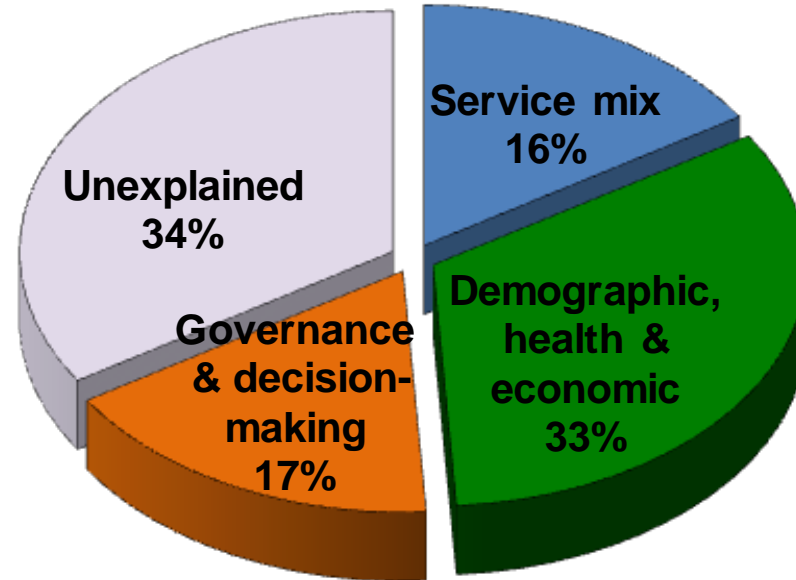


# Changes in Local Public Health Spending 1993-2010



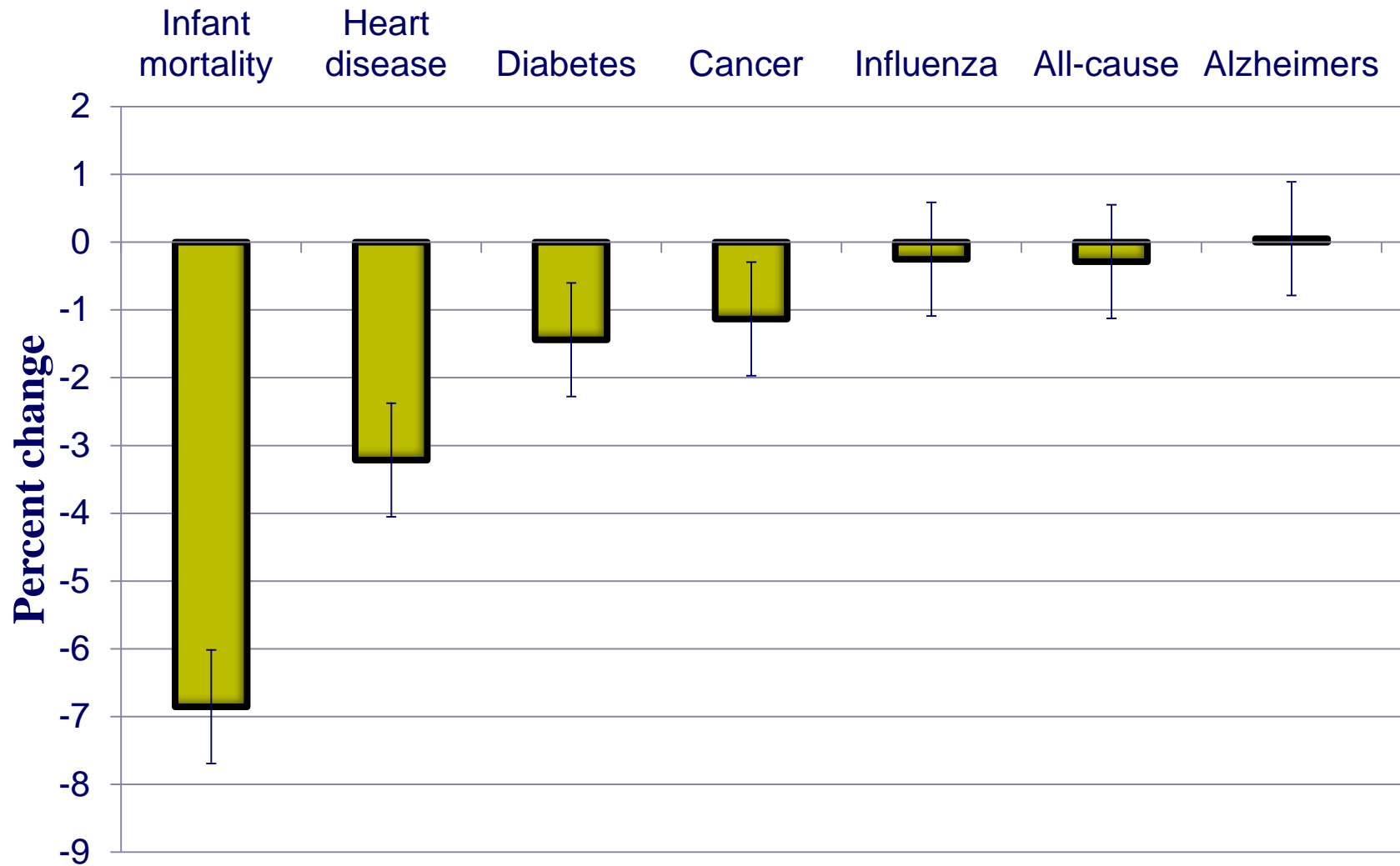


# Determinants of Local Public Health Spending Levels



- Delivery system size & structure
- Service mix
- Population needs and risks
- Efficiency & uncertainty

# Mortality reductions attributable to local public health spending, 1993-2008



Hierarchical regression estimates with instrumental variables to correct for selection and unmeasured confounding

# Effects of public health spending on medical care spending 1993-2008

**Change in Medical Care Spending Per Capita Attributable to 1% Increase in Public Health Spending Per Capita**

<u>Model</u>	<u>N</u>	<u>Elasticity</u>	<u>S.E.</u>	
One year lag	8532	-0.088	0.013	***
Five year lag	6492	-0.112	0.053	**
Ten year lag	4387	-0.179	0.112	

log regression estimates controlling for community-level and state-level characteristics

\*p<0.10      \*\*p<0.05      \*\*\*p<0.01

# Estimated value of public health spending

- ◆ 10% increase in public health spending in average community:

Public health cost	\$594,291	
Medical cost offset	-\$515,114	(Medicare only)
LY gained	148	
Net cost/LY	\$534	

# Conclusions: getting inside the box

- Engagement of practice and research partners
- Better measures and data sources
- Research designs in real-world settings



- What works best in which settings and why
- Informed public health decisions
- Smarter investments and greater value



# For More Information



**Supported by The Robert Wood Johnson Foundation**

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**Journal:** [www.FrontiersinPHSSR.org](http://www.FrontiersinPHSSR.org)



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